REMARKS

Claims 1-9 and 14-17 are cancelled. Claims 10-13 are amended. New claims 18-22 are added. Claims 10-13 and 18-22 are pending in the application. Applicant respectfully requests examination of the pending claims.

Respectfully submitted,

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Addendum

1. Marked-Up Version of Amendments
   copy of drawings from parent application (8 sheets)

Priority Application Serial No. 09/714,714
Priority Filing Date ..... November 15, 2000
Inventor ..... Kardokus, J. et al
Assignee ..... Honeywell International, Inc
Priority Group Art Unit 1742
Priority Examiner ..... Ip, S
Attorney's Docket No. ..... JM34006 DIV
Title: (As Amended) Methods of Forming Copper-Containing Sputtering Targets

MARKED UP VERSION OF AMENDMENTS ACCOMPANYING PRELIMINARY AMENDMENT

In the Specification

The replacement specification paragraphs incorporate the following amendments. Underlines indicate insertions and ~~strikeouts~~ indicate deletions.

The Title has been amended as follows:

~~Copper Sputtering Targets and Method of Making Same~~ Methods of Forming Copper-Containing Sputtering Targets

The Related Patent Data section is added before the Background of the Invention section as follows:

--RELATED PATENT DATA

This patent resulted from a divisional application of U.S. Patent Application Serial No. 09/714,714; which is a continuation application of U.S. Patent Application Serial No. 09/615,474, filed on July 13, 2000; which is a continuation application of U.S. Patent Application Serial No. 09/324,299, filed on June 2, 1999, and now U.S. Patent 6,113,761.--

The paragraph beginning at line 32 on page 4 has been amended as follows:

~~FIGS. 10 and 11 are photomicrographs of a Cu target, CuCr intermediate layer and an Al backing plate; and~~ FIG. 10 is a photomicrograph of a Cu target, CuCr intermediate layer and an Al backing plate;

FIG. 11 is a photomicrograph of a Cu target, CuCr intermediate layer and an Al backing plate; and

The paragraph beginning at line 6 on page 19 has been amended as follows:

~~Described is a sputtering target assembly of high purity copper diffusion bonded to a precipitation hardened aluminum alloy backing plate via an intermediate layer of a CuCr alloy and in which the copper contains a micro alloy addition of at least one of Ag, Su, Te, In, Mg, B, Bi Sb and/or P. Also disclosed is a method that includes preparation of a master alloy for addition to high purity copper and fabricating, heat treating and diffusion bonding processes to produce a sputtering target assembly with a stable fine-grained target microstructure.~~ The invention includes a method of forming a sputtering target containing copper of a purity of at least about 99.999 wt.%, and at least one component selected from the group consisting of Ag, Sn, Te, In, B, Bi, Sb, and P dispersed within the copper. The total of Ag, Sn, Te, In, B, Bi, Sb, and P within the copper is from at least 0.3 ppm to about 10 ppm. The sputtering target has a substantially uniform grain size of less than or equal to about 50 micrometers throughout the copper and the at least one component.

In the Claims

The claims have been amended as follows. Underlines indicate insertions and ~~strikeouts~~ indicate deletions.

10. (Amended) A method of making a sputtering target assembly comprising:

a) providing high purity copper target of at least about 99.999 wt.% purity;

b) preparing a master alloy ~~of~~ comprising copper and not more than about 10 ppm of at least one of Ag, Sn, Te, In, Mg, B, Bi, Sb, and P;

c) preparing a cast billet by forming a molten combination of copper and master alloy and ~~solidify~~ solidifying the molten combination ~~to produce a cast billet~~;

d) ~~hot~~ deforming the cast billet for a total of at least about 50% deformation on each axis and then rapidly quenching the deformed billet~~, preferably in water~~;

e) frictionless forging the quenced billet at elevated temperature to about 70% of the starting length of the billet, and rapidly quenching~~, preferably in water~~;

f) cold rolling to a total of about 90% deformation;

g) providing an aluminum alloy backing plate having a preclad CuCr surface; and precipitation hardening the aluminum alloy backing plate ~~to the fully hard T6 condition~~.

11. (Amended) A method according to claim ~~9~~ 10 wherein the preparing said master alloy ~~is prepared by~~ comprises:

forming a combination by combining ~~a major amount of~~ the high purity copper with ~~a minor amount of~~ the at least one of Ag, Sn, Ti, In, Mg, B, Bi, Sb, and P;

melting the combination; and

casting the combination ~~to produce a master alloy~~.

12. (Amended) A method according to claim ~~10~~ 11 wherein the high purity copper is combined with the at least one of Ag, Sn, Ti, In, Mg, B, Bi, Sb, and ~~and/or~~ P in a ratio of about 1000 to 1.

13. (Amended) A method according to claim ~~9~~ 10 further comprising:

forming ~~wherein~~ the aluminum alloy backing plate wherein the forming comprises:

~~having a precladding surface of CuCr diffusion bonded thereto is used which is produced by a process comprising~~ embedding an alloy of Cu and Cr in an aluminum or aluminum alloy envelope; ~~and e-beam~~

welding the envelope closed in a vacuum environment;

heat treating the enclosed envelope; ~~and~~

forging, wherein the forging ~~to bring~~ brings the CuCr into intimate contact with the aluminum alloy to be used as a backing plate;

quenching;

removing the aluminum alloy envelope to expose the CuCr surface; and

precipitation ~~harden~~ hardening the aluminum alloy ~~to full hard T6 condition~~.

18. A method of forming a sputtering target comprising:

forming a master alloy comprising:

a first high purity copper material; and

a micro-alloy grain stabilizer comprising at least one of Ag, Sn, Te, In, Mg, B, Bi, Sb, and P dispersed within the first high purity copper material;

adding an amount of the master alloy to a second high purity copper material to form a sputtering target composition having a desired concentration of the micro-alloy grain stabilizer dispersed within copper; and

shaping the sputtering target composition into a target configuration.

19. The method of claim 18 wherein the forming the master alloy comprises combining the first high purity copper material with the micro-alloy grain stabilizer in a ratio of at least about 1000 parts copper to 1 part of the micro-alloy grain stabilizer.

20. The method of claim 18 wherein the first and second high purity copper materials have a purities of at least about 99.999 wt.%.

21. The method of claim 18 wherein the first and second high purity copper materials have a purities of at least about 99.9995 wt.%.

22. The method of claim 18 wherein the micro-alloy grain stabilizer is silver.

END OF DOCUMENT